US009199812B2

(12) **United States Patent**
**Fujikura**

(10) **Patent No.: US 9,199,812 B2**
(45) **Date of Patent: Dec. 1, 2015**

(54) **SHEET FEEDING DEVICE, AND IMAGE FORMING APPARATUS**

(71) Applicant: **FUJI XEROX CO., LTD.**, Tokyo (JP)

(72) Inventor: **Hiroaki Fujikura**, Kanagawa (JP)

(73) Assignee: **FUJI XEROX CO., LTD.**, Tokyo (JP)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/526,873**

(22) Filed: **Oct. 29, 2014**

(65) **Prior Publication Data**

US 2015/0217954 A1 Aug. 6, 2015

(30) **Foreign Application Priority Data**

Jan. 31, 2014 (JP) ..... 2014-017935

(51) **Int. Cl.**

| | |
|---|---|
| ***B65H 1/00*** | (2006.01) |
| ***B65H 5/22*** | (2006.01) |
| ***G03G 15/00*** | (2006.01) |
| ***B65H 3/08*** | (2006.01) |
| ***B65H 1/04*** | (2006.01) |

(52) **U.S. Cl.**

CPC ..... ***B65H 5/228*** (2013.01); ***B65H 1/04*** (2013.01); ***B65H 3/08*** (2013.01); ***G03G 15/6529*** (2013.01)

(58) **Field of Classification Search**

CPC ..... B65H 3/48; B65H 5/22; B65H 2406/12; B65H 2406/122; B65H 2406/1222; B65H 2406/41; B65H 2406/411; B65H 2406/422; B65H 2511/12; B65H 2701/1131

USPC ..... 271/11, 90, 97, 96, 94

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2009/0283958 A1* 11/2009 Takahashi ..... 271/12

FOREIGN PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| JP | 2009-113953 | * | 5/2009 |
| JP | 2010-105777 A | | 5/2010 |
| JP | 2010-126296 | * | 6/2010 |

OTHER PUBLICATIONS

Machine translation of Detailed Description section of JP2010-126296.*

* cited by examiner

*Primary Examiner* — Thomas Morrison
(74) *Attorney, Agent, or Firm* — Oliff PLC

(57) **ABSTRACT**

Provided is a sheet feeding device including a first arrangement member that abuts an end portion in a width direction of a fed and stacked sheet material, arranges the width direction of the sheet material, and forms a first blown-out port, a second arrangement member that is mounted on the first arrangement member, is disposed in a sheet material side with respect to the first arrangement member, abuts an end portion in a width direction of a small sheet material having a narrower width than the sheet material arranged by the first arrangement member, arranges the width direction of the small sheet material, and forms a second blown-out port, and a passage member that forms a passage introducing the air blown out from the first blown-out port to the second blown-out port.

**6 Claims, 11 Drawing Sheets**

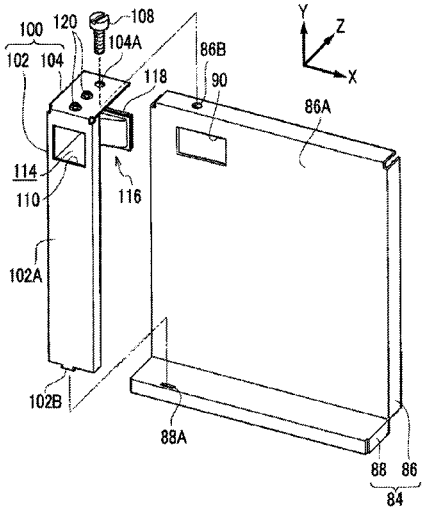


FIG. 1A

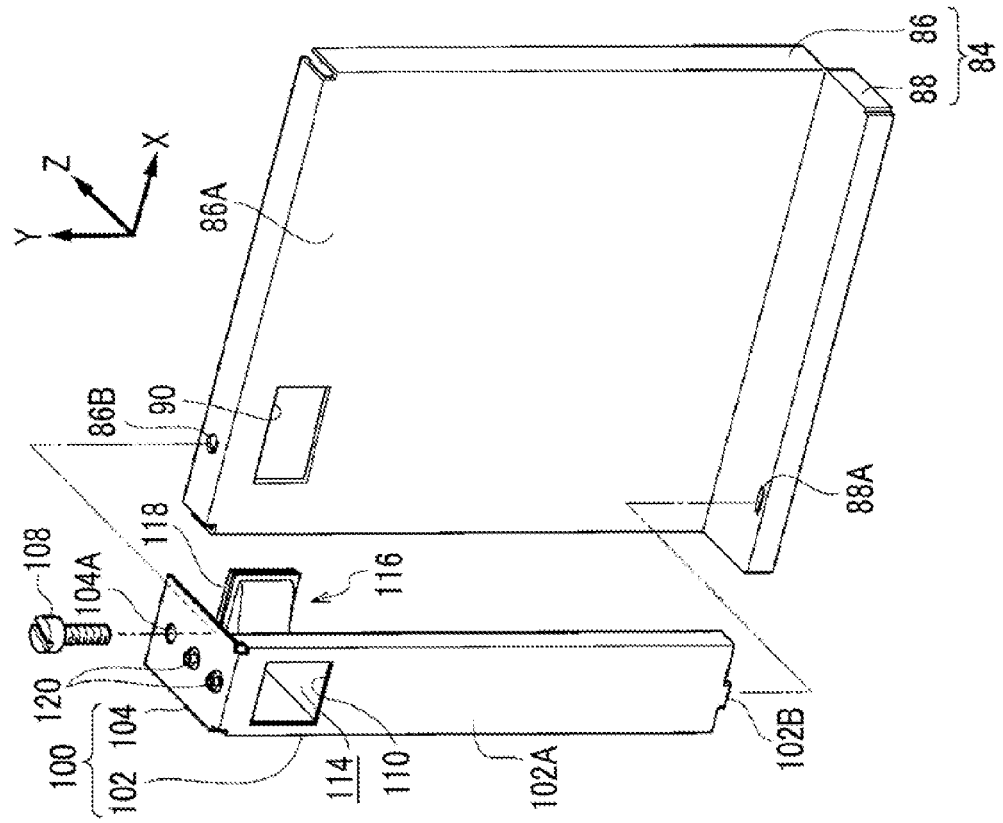

Z
X
Y
86
84
88
86A
86B
90
118
116
108
104A
120
100
104
102
114
110
102A
102B
88A

FIG. 1B

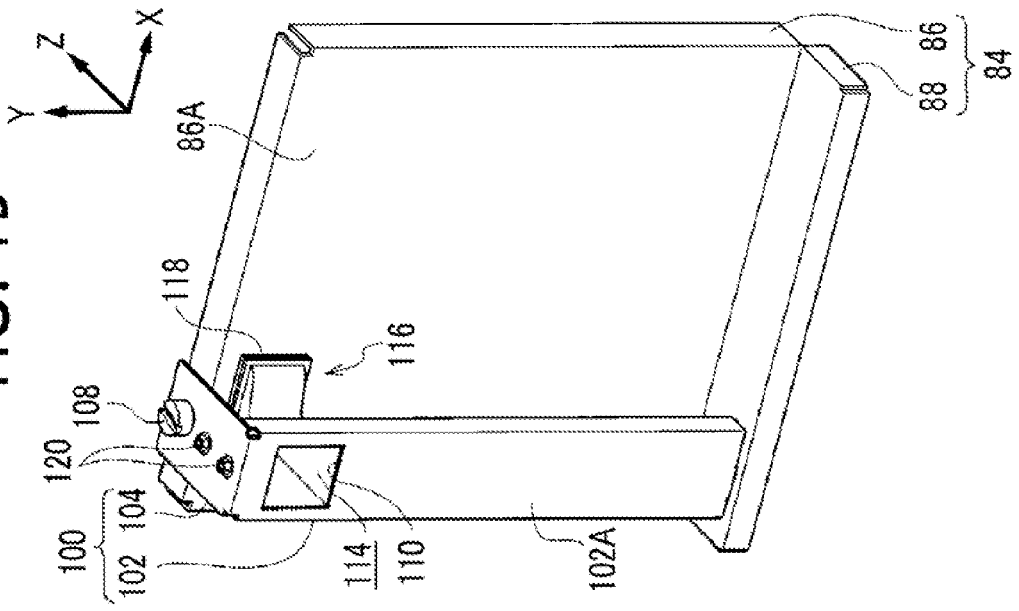

Z
X
Y
86
84
88
86A
118
116
108
120
100
104
102
114
110
102A

FIG. 2

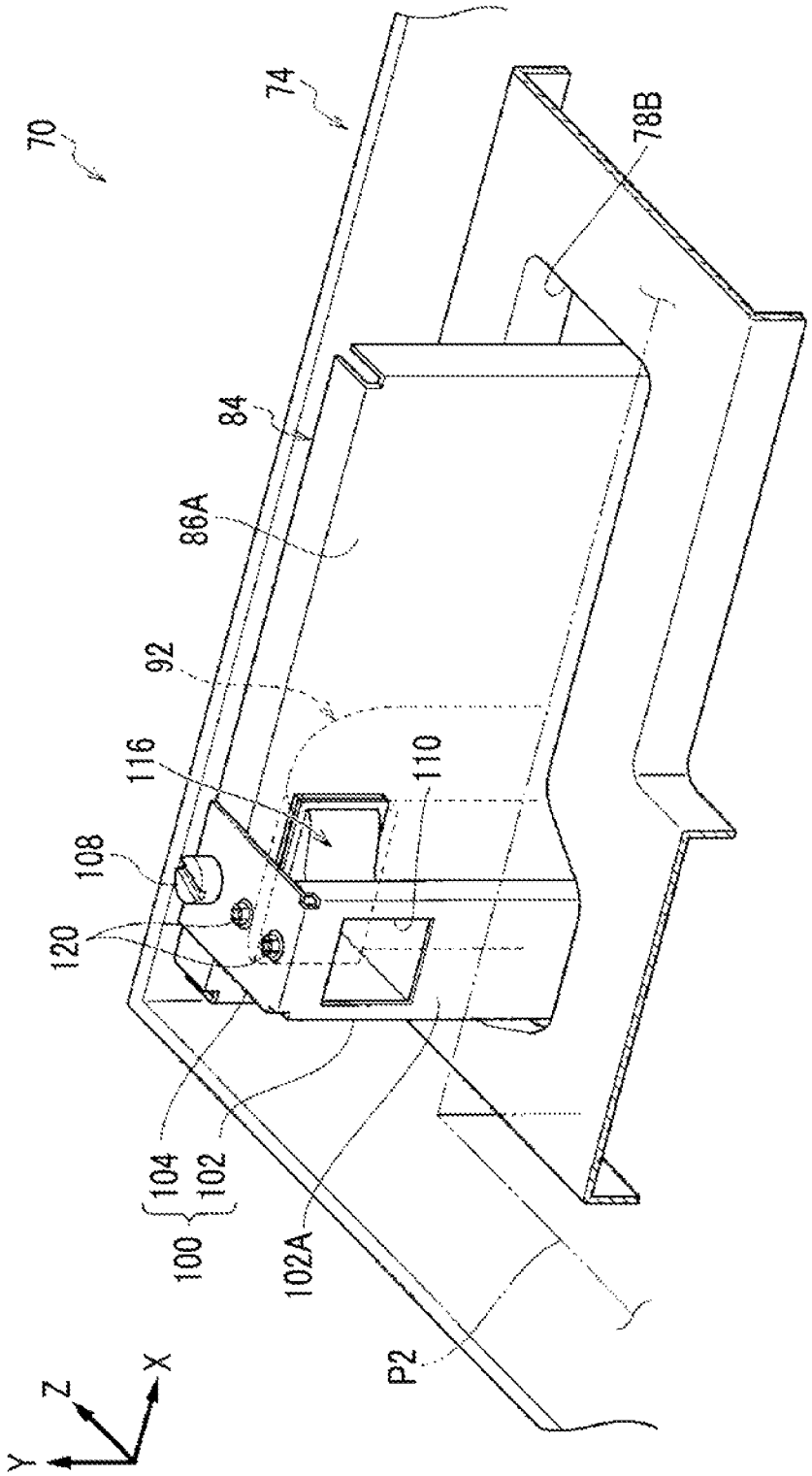


FIG. 3

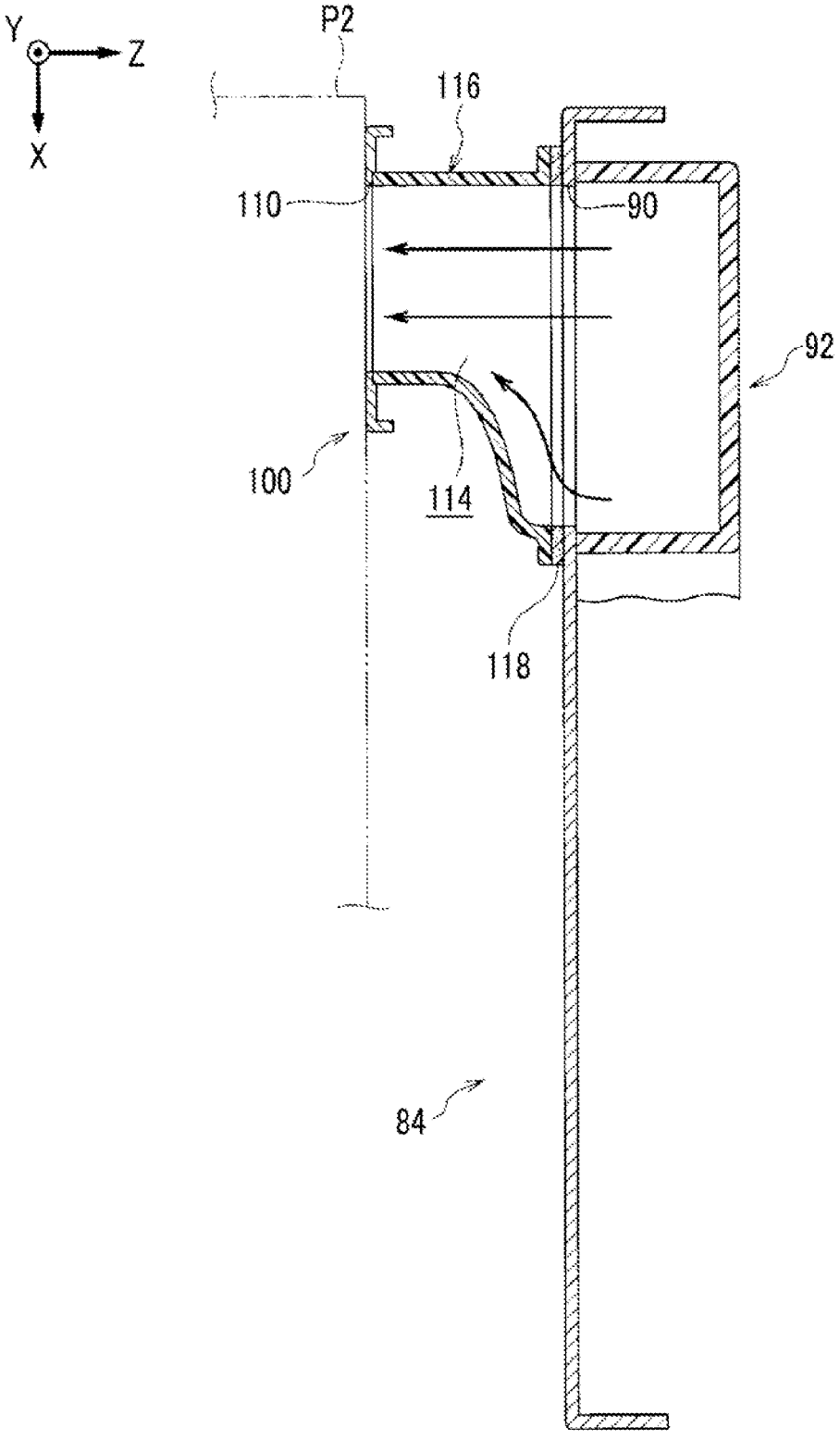


FIG. 4

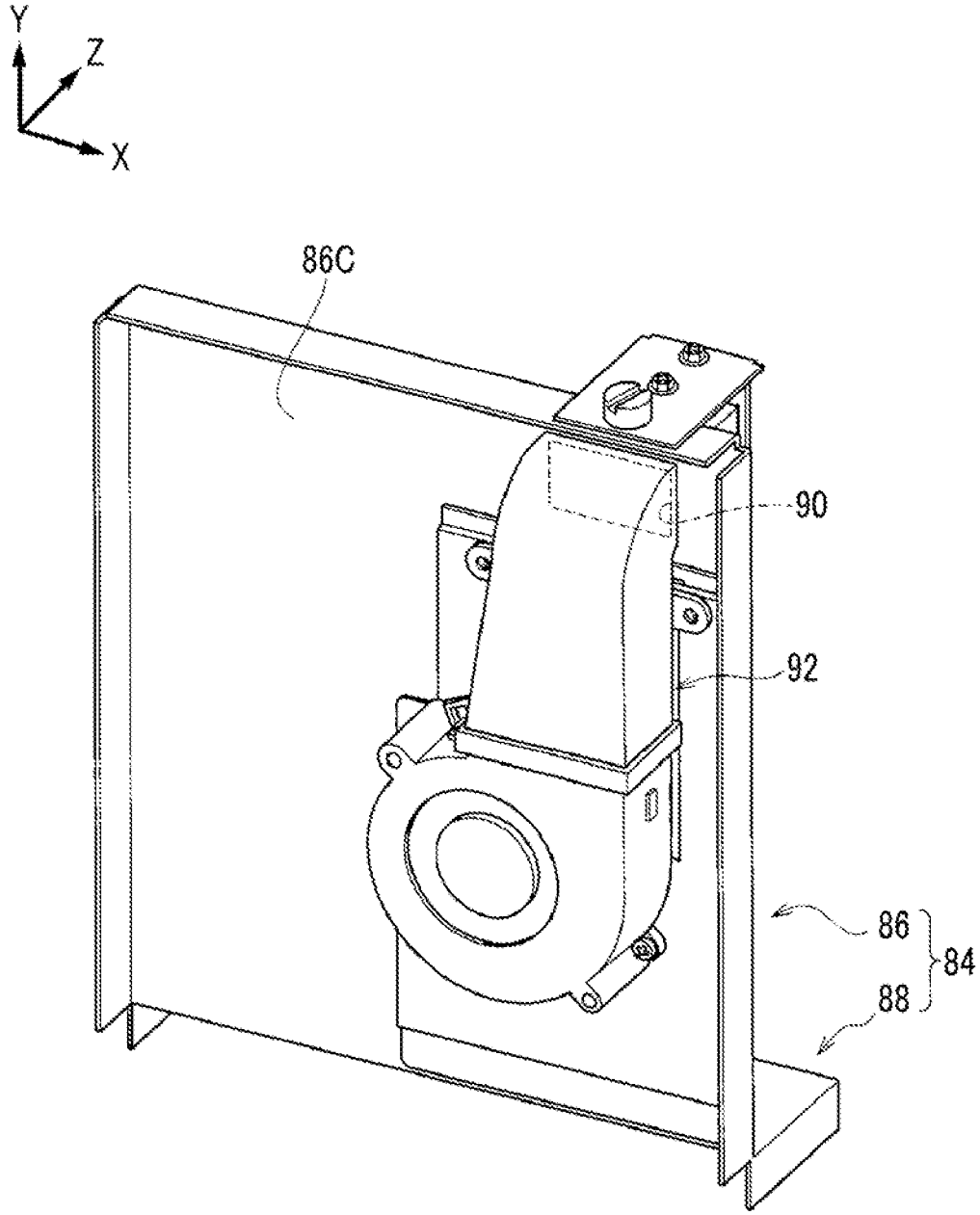


FIG. 5

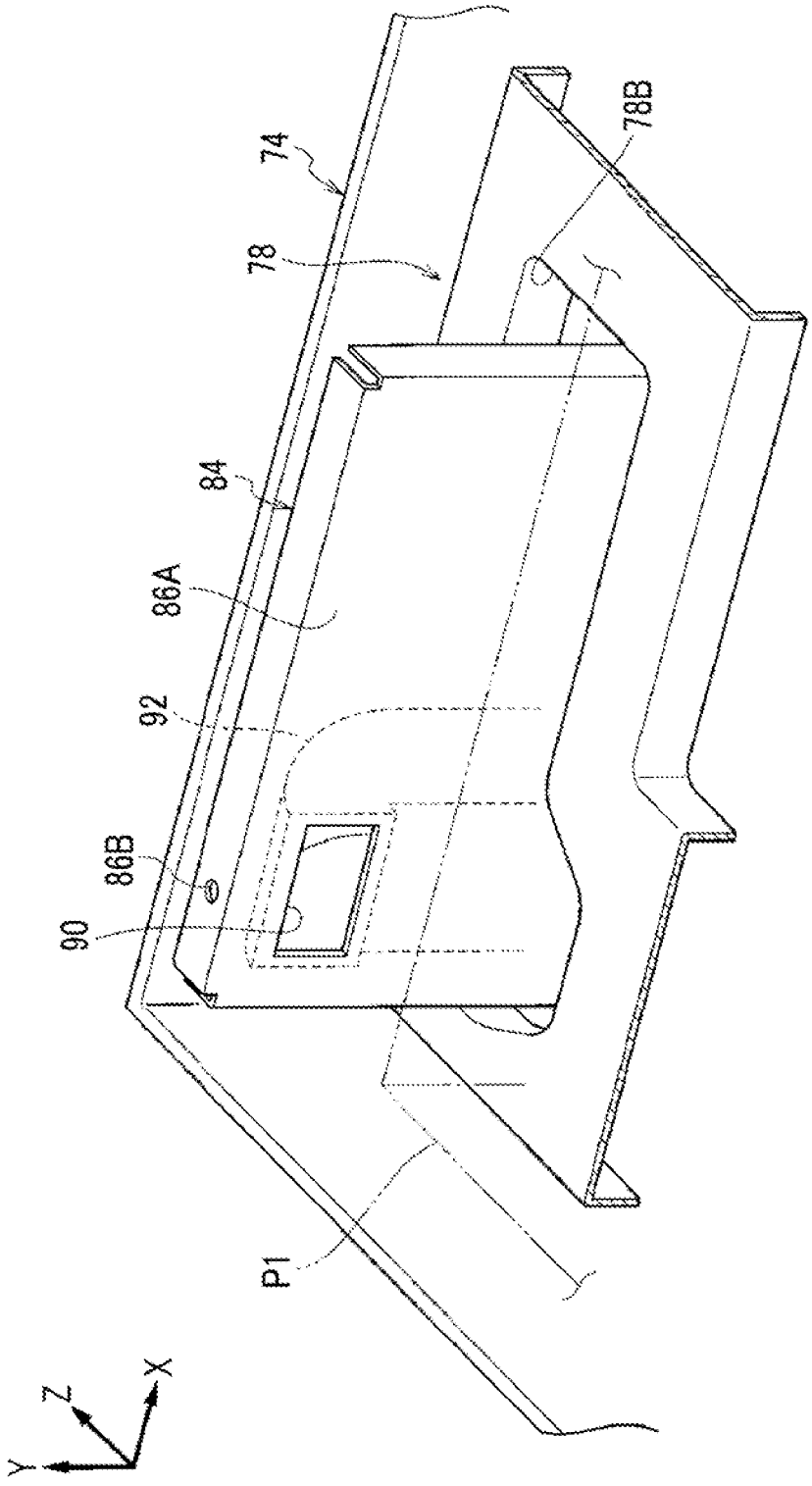


FIG. 6

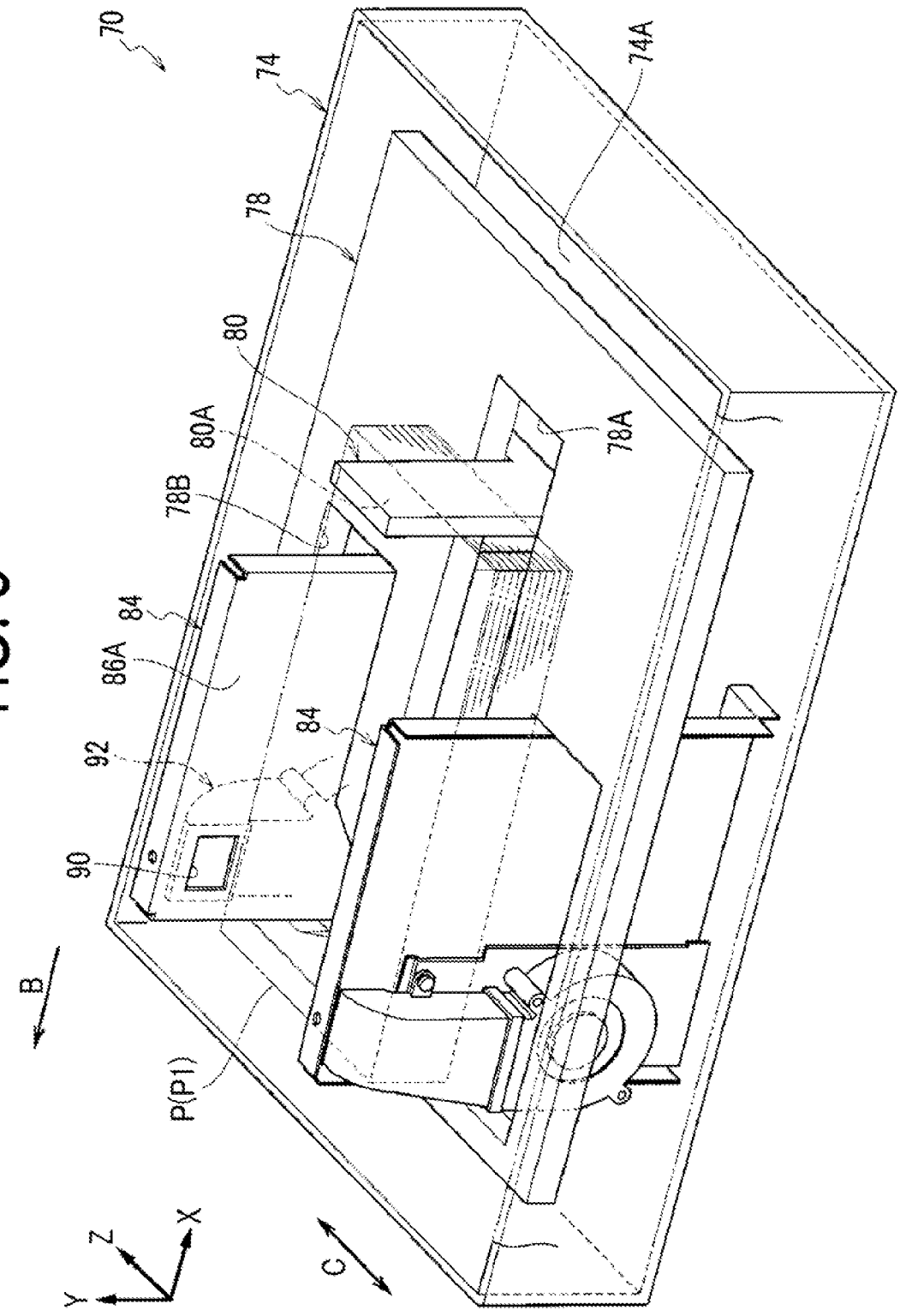


FIG. 7

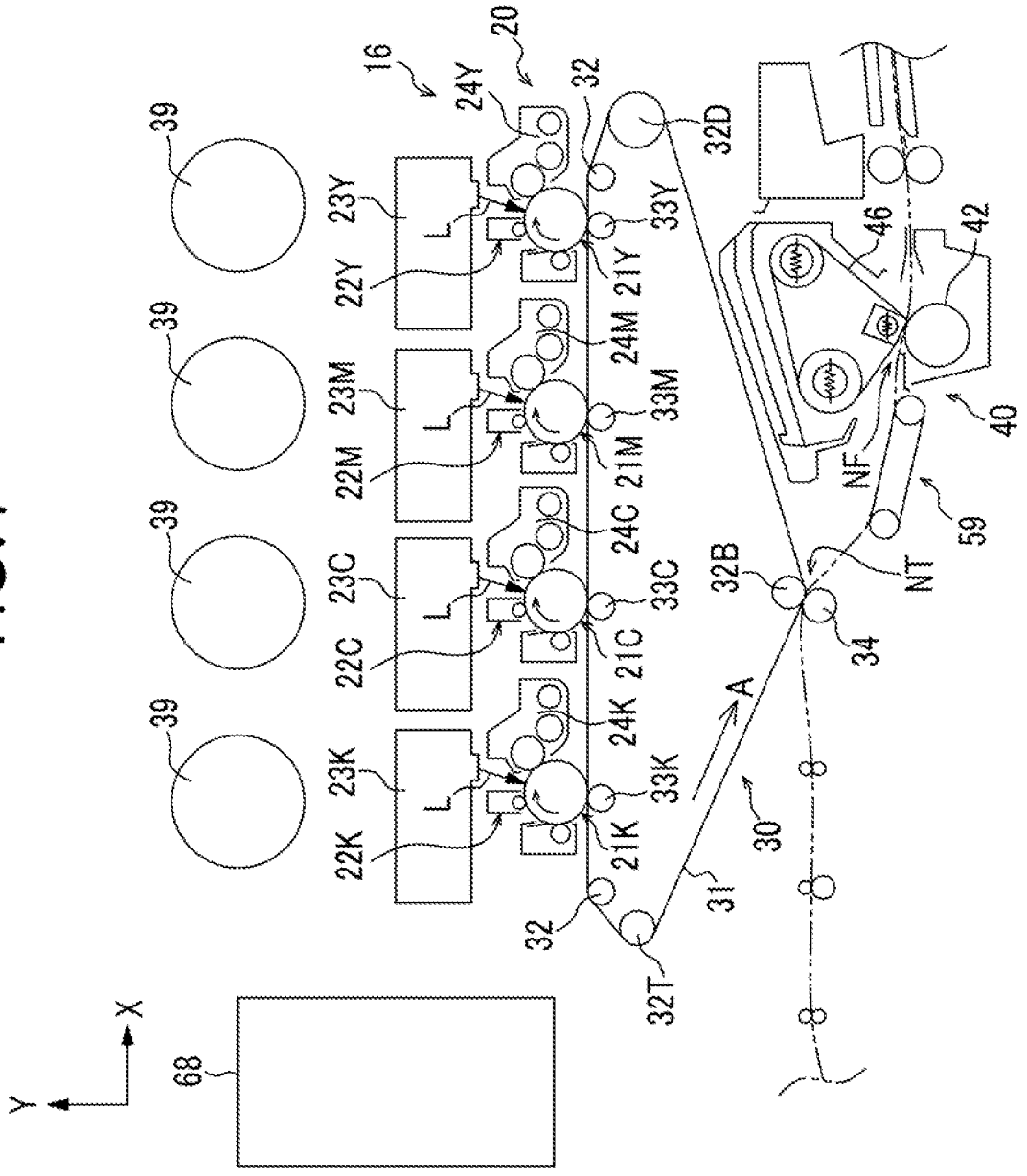

16
20
24Y
32
32D
39
23Y
22Y
L
33Y
21Y
24M
46
42
23M
22M
33M
21M
40
NF
24C
59
23C
22C
33C
21C
32B
NT
34
24K
A
23K
22K
33K
21K
30
31
32
32T
68
Y
X

FIG. 8

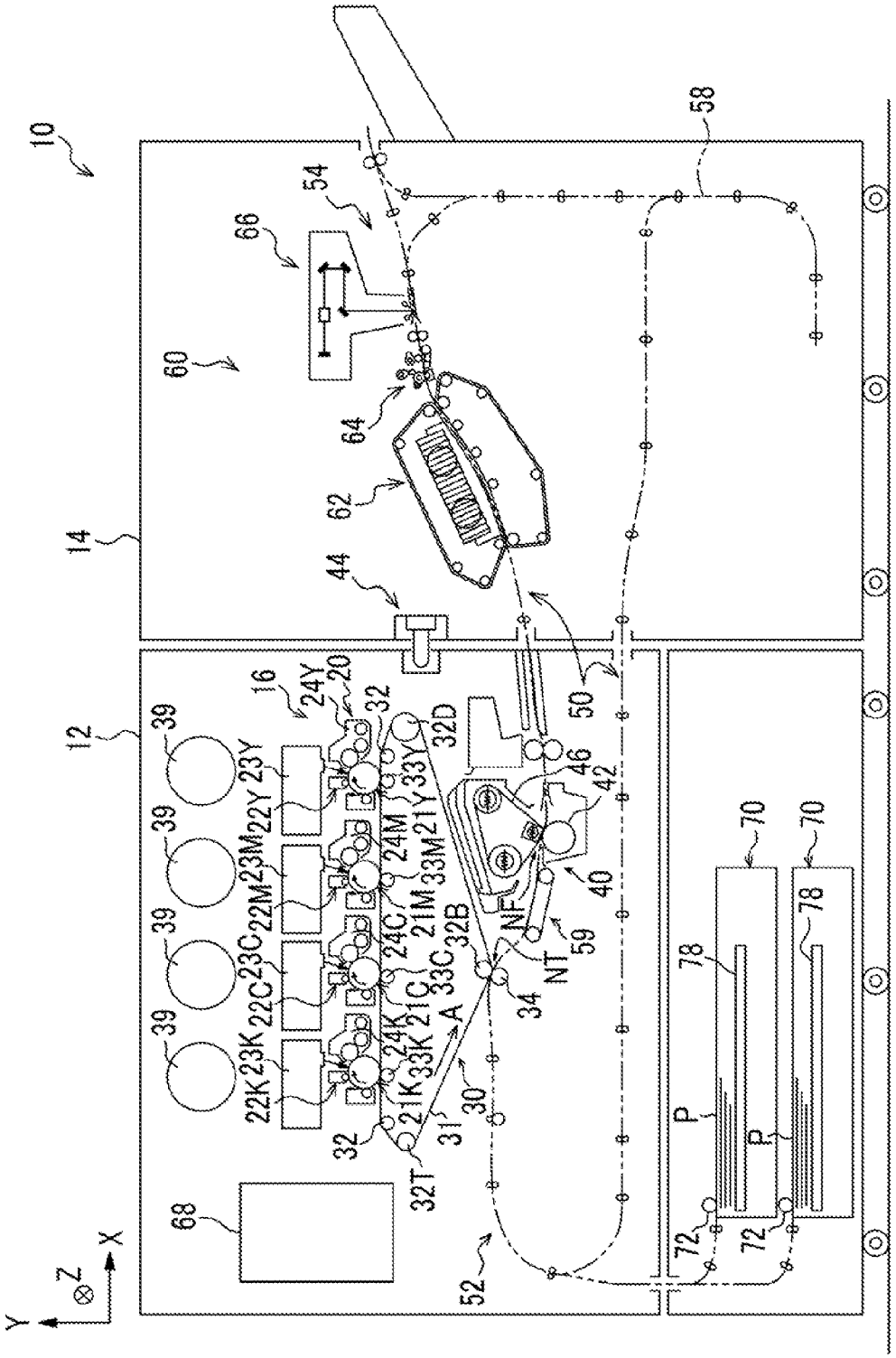

10
12
14
16
20
24Y
23Y
22Y
24M
23M
22M
24C
23C
22C
24K
23K
22K
21Y
21M
21C
21K
32
32B
32D
33Y
33M
33C
33K
32T
34
30
31
A
NF
NT
40
42
46
50
52
54
58
59
60
62
64
66
68
70
72
78
P
39
X
Y
Z

FIG. 9

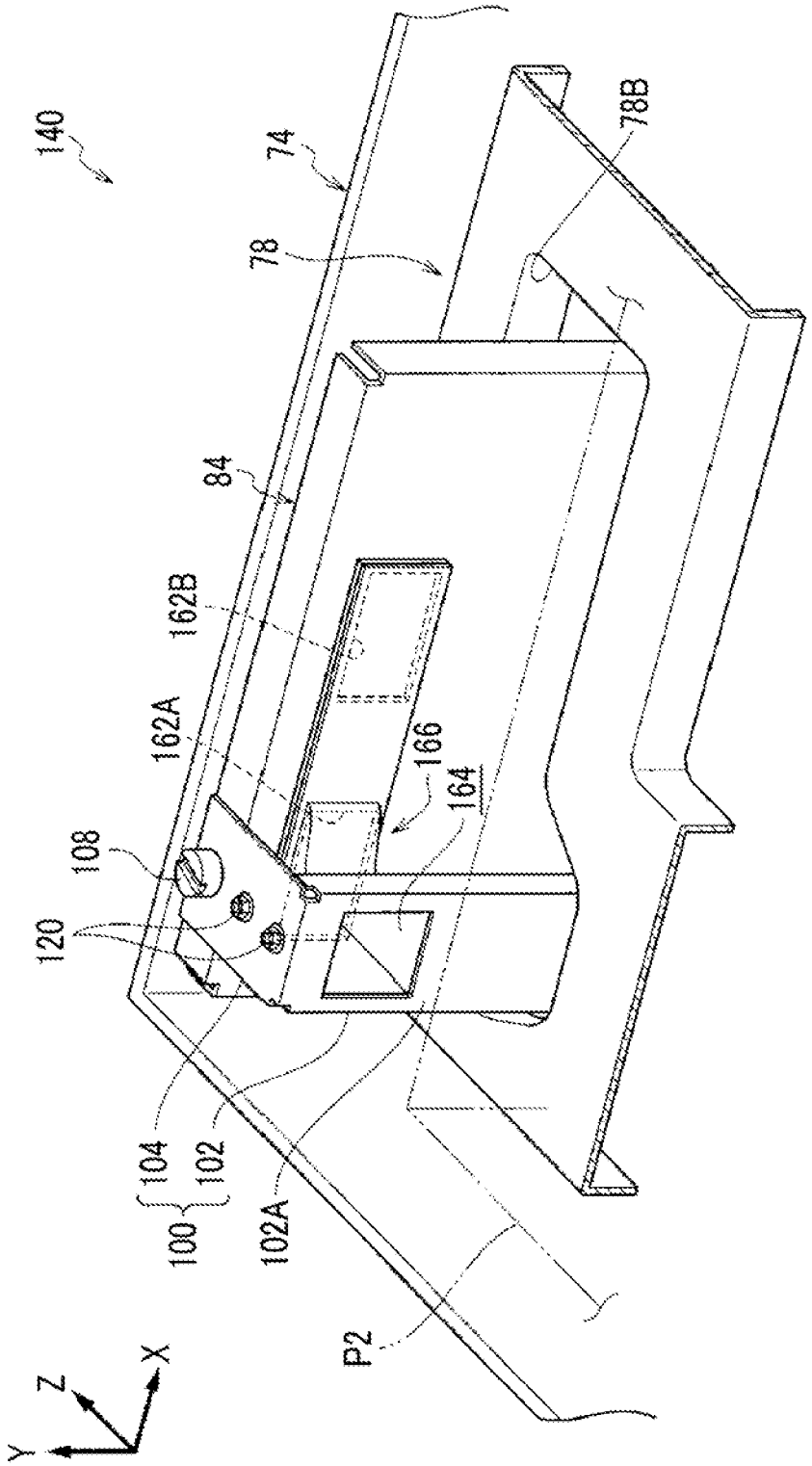

140
74
78
78B
84
162B
162A
166
164
108
120
104
102
100
102A
P2
Z
X
Y

FIG. 10

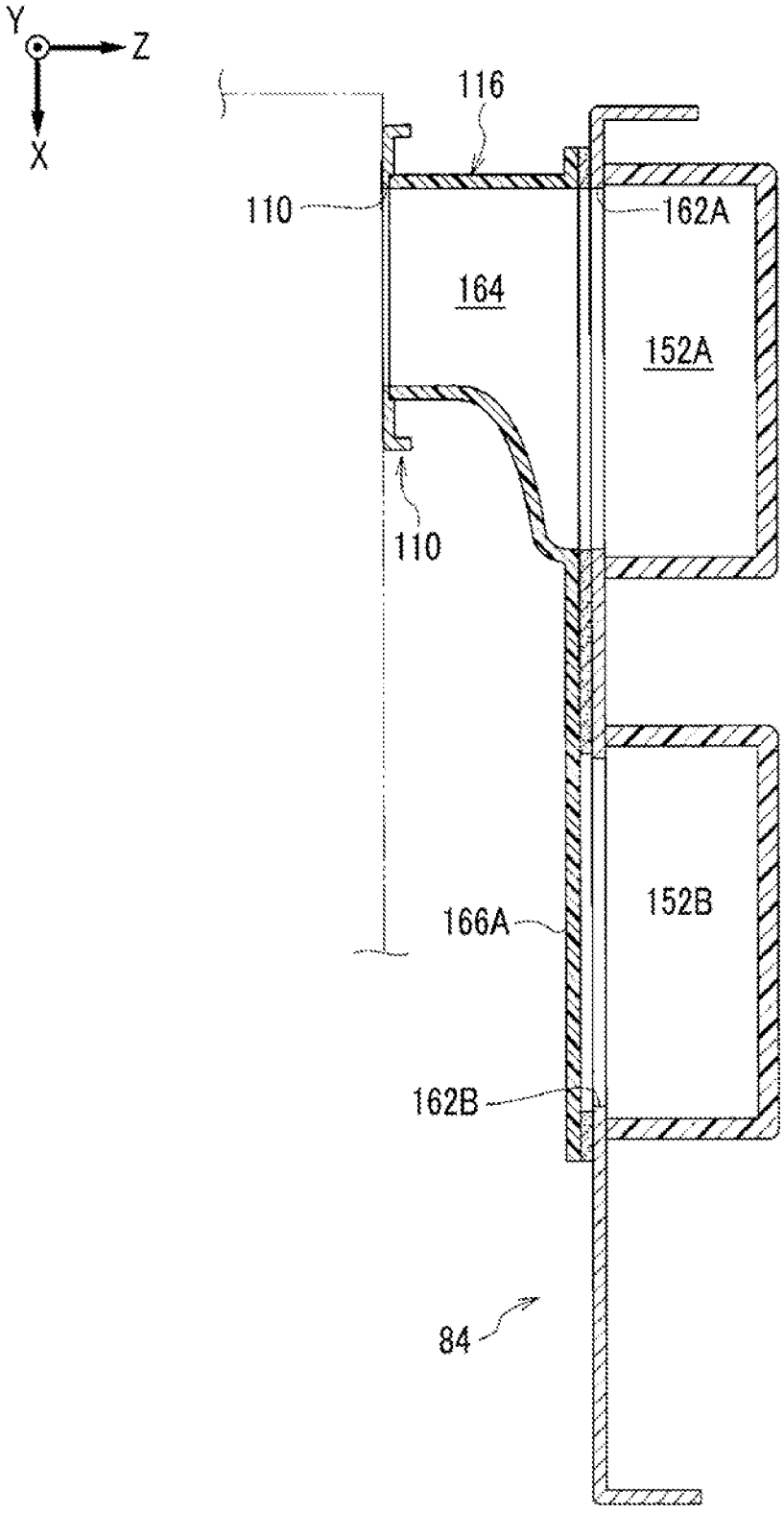
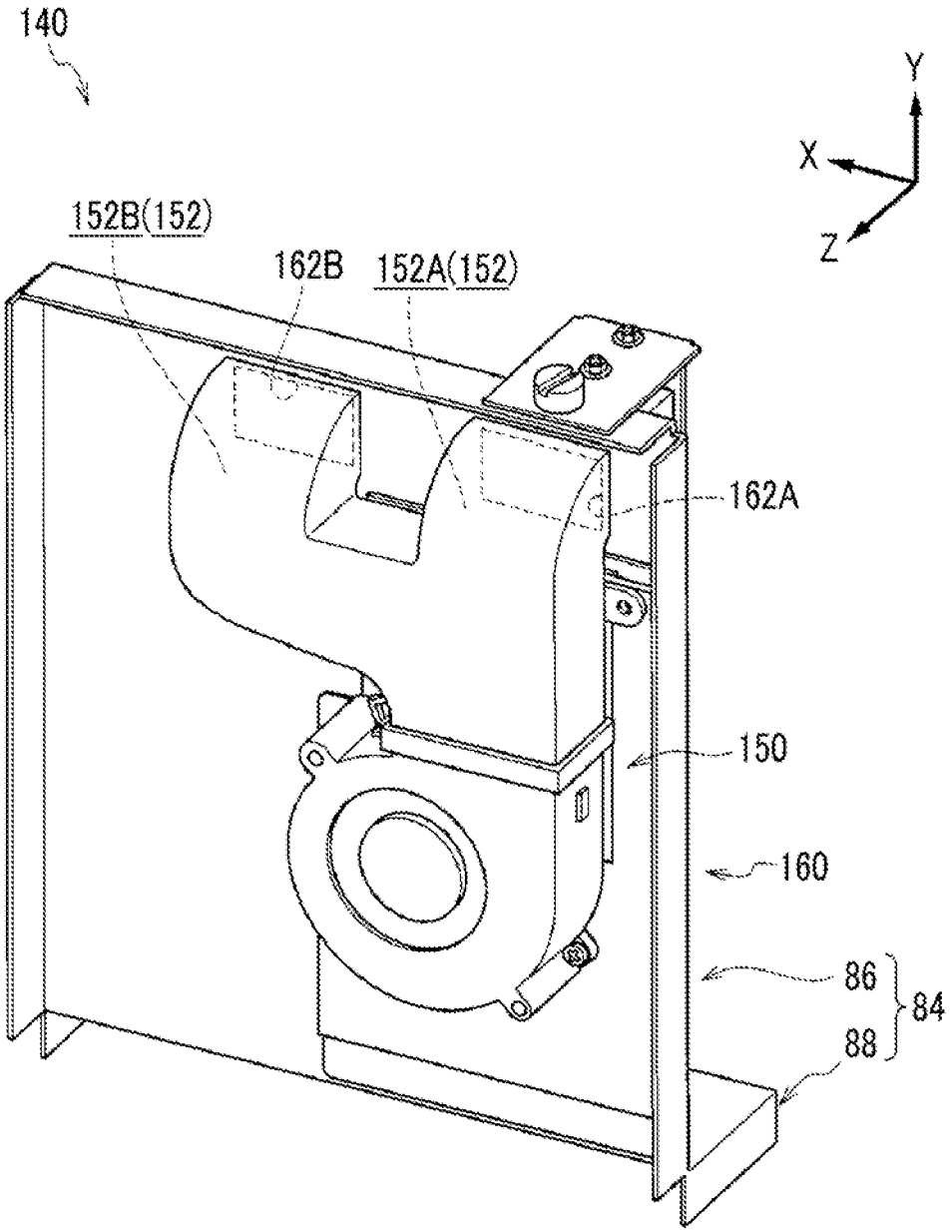


FIG. 11



# SHEET FEEDING DEVICE, AND IMAGE FORMING APPARATUS

## CROSS-REFERENCE TO RELATED APPLICATIONS

This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2014-017935 filed Jan. 31, 2014.

## BACKGROUND

### Technical Field

The present invention relates to a sheet feeding device, and an image forming apparatus.

## SUMMARY

According to an aspect of the invention, there is provided a sheet feeding device including:

a first arrangement member that abuts an end portion in a width direction of a fed and stacked sheet material, arranges the width direction of the sheet material, and forms a first blown-out port from which air sprayed to the end portion in the width direction of the sheet material is blown out;

a second arrangement member that is mounted on the first arrangement member, is disposed in a sheet material side with respect to the first arrangement member, abuts an end portion in a width direction of a small sheet material having a narrower width than the sheet material arranged by the first arrangement member, arranges the width direction of the small sheet material, and forms a second blown-out port from which air sprayed to the end portion in the width direction of the stacked small sheet material is blown out; and

a passage member that forms a passage introducing the air blown out from the first blown-out port to the second blown-out port.

## BRIEF DESCRIPTION OF THE DRAWINGS

Exemplary embodiments of the present invention will be described in detail based on the following figures, wherein:

FIGS. **1**A and **1**B are perspective views showing a side guide and a small guide used in a sheet feeding device according to a first exemplary embodiment of the present invention;

FIG. **2** is an enlarged perspective view showing the side guide and the small guide used in the sheet feeding device according to the first exemplary embodiment of the present invention;

FIG. **3** is a cross-sectional view showing the side guide and the small guide used in the sheet feeding device according to the first exemplary embodiment of the present invention;

FIG. **4** is a perspective view showing a blower used in the sheet feeding device according to the first exemplary embodiment of the present invention;

FIG. **5** is an enlarged perspective view showing the side guide used in the sheet feeding device according to the first exemplary embodiment of the present invention;

FIG. **6** is a perspective view showing the sheet feeding device according to the first exemplary embodiment of the present invention;

FIG. **7** is a configurational diagram showing a toner image forming portion or the like of an image forming apparatus according to the first exemplary embodiment of the present invention;



FIG. **8** is a schematic configurational diagram showing the image forming apparatus according to the first exemplary embodiment of the present invention;

FIG. **9** is an enlarged perspective view showing a side guide and a small guide used in a sheet feeding device according to a second exemplary embodiment of the present invention;

FIG. **10** is a cross-sectional view showing the side guide and the small guide used in the sheet feeding device according to the second exemplary embodiment of the present invention; and

FIG. **11** is a perspective view showing a blower used in the sheet feeding device according to the second exemplary embodiment of the present invention.

## DETAILED DESCRIPTION

### First Exemplary Embodiment

Examples of a sheet feeding device and an image forming apparatus according to a first exemplary embodiment of the present invention will be described with reference to FIGS. **1**A to **8**. Moreover, in the drawings, an arrow Y direction indicates a vertical direction and an up-down direction of an apparatus, an arrow X direction indicates a horizontal direction and a width direction of the apparatus, and an arrow Z direction indicates the horizontal direction and a depth of the apparatus.

Overall Configuration of Image Forming Apparatus

As shown in FIG. **8**, an image forming apparatus **10** is configured to include a first housing **12**, a second housing **14**, an image forming portion **16**, a medium transport portion **50**, a post-processing portion **60**, and a control portion **68**. Moreover, the control portion **68** controls each portion configuring the image forming apparatus **10** (each portion or the like configuring the image forming portion **16**).

In addition, the first housing **12** and the second housing **14** are disposed to be arranged in a width direction of the apparatus, and are connected to each other by a connection mechanism **44**.

Image Forming Portion **16**

The image forming portion **16** is disposed in the inner portion of the first housing **12**, and as shown in FIG. **7**, is configured to include a toner image forming portion **20** which forms a toner image, a transfer device **30** which transfers an image formed by the toner image forming portion **20** to a sheet material P which is a recording medium, and a fixing device **40** which fixes the toner image transferred to the sheet material P to the sheet material P. In addition, the image forming portion **16** forms the image on the sheet material P by an electro-photographic method.

Toner Image Forming Portion **20**

The toner image forming portion **20** is configured to include a photosensitive drum **21** which is an image holding member, a charging unit **22**, an exposure device **23**, and a developing device **24**. Plural toner image forming portions **20** are provided to form the toner image for each color. In the present embodiment, a total of four toner image forming portions **20** for yellow (Y), magenta (M), cyan (C), and black (K) are provided. In addition, the toner image forming portions **20** for each color have a similar configuration. In addition, in a circumferential direction of a transfer belt **31** included in the transfer device **30**, the photosensitive drum **21** of the toner image forming portion **20** for each color comes into contact with the transfer belt **31** in the order of yellow (Y), magenta (M), cyan (C), and black (K) from the upstream side. In addition, the toner image forming portions **20** for each color are disposed to be arranged in the width direction of the

apparatus. Moreover, when it is not necessary to distinguish and describe Y, M, C, and K, Y, M, C, and K may be omitted.

The photosensitive drum **21** is formed in a cylindrical shape, and is driven to be rotated around its own axis by a driving unit (not shown). As one example, a photosensitive layer exhibiting a negative charging polarity is formed on the outer circumferential surface of the photosensitive drum **21**.

The charging unit **22** comes into contact with the outer circumferential surface (photosensitive layer) of the photosensitive drum **21**, and charges the outer circumferential surface of the photosensitive drum **21** to a negative polarity while being rotated following the rotating photosensitive drum **21**.

The exposure device **23** forms an electrostatic latent image on the outer circumferential surface of the photosensitive drum **21**. Specifically, modulated exposure light L is radiated to the outer circumferential surface of the photosensitive drum **21** charged by the charging unit **22** according to image data received from an image signal processing portion configuring the control portion **68**. In addition, an electrostatic latent image is formed on the outer circumferential surface of the photosensitive drum **21** by the radiation of the exposure light L.

In the present embodiment, the exposure device **23** is configured to expose the outer circumferential surface of the photosensitive drum **21** while performing scanning of the light beam radiated from a light source (not shown) by a light scanning unit (optical system) including a polygon mirror or an Fθ lens.

The developing device **24** develops the electrostatic latent image formed on the outer circumferential surface of the photosensitive drum **21** as a toner image by a developer G including toner T and a carrier CA, and forms the toner image on the outer circumferential surface of the photosensitive drum **21**. A powder accommodating container **39** (toner cartridge) for replenishing the toner T to the developing device **24** is connected to the developing device **24** via a transport path (not shown). The powder accommodating containers **39** for each color are disposed to be arranged in the width direction of the apparatus above the exposure device **23**, and may be individually mounted and detached (may be replaced) to the first housing **12**.

The transfer device **30** includes the endless transfer belt **31** to which the toner image of the photosensitive drum **21** for each color is transferred, and the transfer belt **31** is wound on plural rollers **32** and the posture of the transfer belt is determined. In the present embodiment, the posture of the transfer belt **31** is a reverse obtuse-angle triangle which is long in the width direction of the apparatus when viewed from the front side.

Among the plural rollers **32**, a roller **32**D functions as a driving roller which circulates the transfer belt **31** in an arrow A direction by the power of a motor (not shown). In addition, among the plural rollers **32**, a roller **32**T functions as a tension applying roller which applies tension to the transfer belt **31**. Among the plural rollers **32**, a roller **32**B functions as a roller opposing a secondary image transfer roller **34** described below.

In addition, a primary image transfer roller **33**, which transfers the toner image formed on the outer circumferential surface of the photosensitive drum **21** to the transfer belt **31**, is disposed on a side opposite to each photosensitive drum **21** with respect to the transfer belt **31**.

In addition, the secondary image transfer roller **34**, which transfers the toner image transferred to the transfer belt **31** to the sheet material P, comes into contact with the apex of the lower end side configuring the obtuse angle of the transfer belt **31**, and a transfer nip NT is formed by the transfer belt **31** and the secondary image transfer roller **34**.

The fixing device **40** fixes the toner image on the sheet material P to which the toner image is transferred in the transfer device **30**. In the present embodiment, the fixing device **40** heats and presses the toner image in a fixing nip NF configured of a fixing belt **46** and a press roller **42**, and fixes the toner image to the sheet material P.

Medium Transport Portion **50**

As shown in FIG. **8**, the medium transport portion **50** is configured to include a medium supply portion **52** which supplies the sheet material P to the image forming portion **16**, and a medium discharging portion **54** which discharges the sheet material P on which the image is formed. In addition, the medium transport portion **50** is configured to include a medium returning portion **58** which is used when the images are formed on both surfaces of the sheet material P, and an intermediate transport portion **59** which transports the sheet material P from the transfer device **30** to the fixing device **40**.

The medium supply portion **52** includes a sheet feeding device **70** in which the sheet materials P are stacked. Moreover, the sheet materials stacked on the sheet feeding device **70** are fed to the transfer nip NT one by one in accordance with a transfer timing at the transfer nip NT. Moreover, the sheet feeding device **70** will be described in detail below.

On the other hand, the medium discharging portion **54** discharges the sheet material P, to which the toner image is fixed by the fixing device **40**, to the outside of the apparatus. Moreover, the medium returning portion **58** inverts the front and rear of the sheet material P when an image is formed on the other surface of the sheet material P in which the toner image is fixed to one surface, and returns the inverted sheet material to the image forming portion **16** (medium supply portion **52**).

Post-Processing Portion **60**

As shown in FIG. **8**, the post-processing portion **60** is disposed in the inner portion of the second housing **14**, and is configured to include a medium cooling portion **62** which cools the sheet material P on which the image is formed, a correction device **64** which corrects a curve of the sheet material P, and an image inspection portion **66** which inspects the image.

In addition, each portion configuring the post-processing portion **60** is disposed in the medium discharging portion **54** of the medium transport portion **50**, and the medium cooling portion **62**, the correction device **64**, and the image inspection portion **66** are disposed in this order from the upstream side in the discharging direction of the sheet material P.

Image Forming Operation

Next, outlines of an image forming process and a post-processing process to the sheet material P by the image forming apparatus **10** will be described.

The control portion **68**, which receives an image forming command, operates the toner image forming portion **20**, the transfer device **30**, and the fixing device **40**. Accordingly, developing rollers (the reference numerals are omitted) included in the photosensitive drum **21** and the developing device **24** are rotated, and thus, the transfer belt **31** is circulated. In addition, the press roller **42** is rotated, and the fixing belt **46** is circulated. Moreover, in synchronization with the operation, the control portion **68** operates the medium transport portion **50** or the like.

Accordingly, the photosensitive drum **21** for each color is charged by the charging unit **22** while being rotated. In addition, the control portion **68** sends the image data, which is subject to image processing by the image signal processing portion, to the exposure device **23** for each color. The expo-

sure device **23** for each color emits the exposure light L for each color according to the image data, and exposes the charged photosensitive drum **21** for each color. Moreover, an electrostatic latent image is formed on the outer circumferential surface of the photosensitive drum **21** for each color. The electrostatic latent image formed on the photosensitive drum **21** for each color is developed as the toner image by the developer G supplied from the developing device **24**. Accordingly, among yellow (Y), magenta (M), cyan (C), and black (K), the toner image of the corresponding color is formed on the photosensitive drum **21** for each color.

Moreover, the toner images for each color formed on the photosensitive drums **21** for each color are sequentially transferred to the transfer belt **31** which is circulated by the primary image transfer rollers **33** for each color. Accordingly, an overlapped toner image, in which the toner images of four colors are overlapped, is formed on the transfer belt **31**. The overlapped toner image is transported to the transfer nip NT by the circulation of the transfer belt **31**. The sheet material P is supplied to the transfer nip NT by the medium supply portion **52** in accordance with the timing of the transport of the overlapped toner image. In the transfer nip NT, a transfer voltage is applied to the secondary image transfer roller **34**, and thus, the toner image is transferred from the transfer belt **31** to the sheet material P.

The sheet material P, to which the toner image is transferred, is transported from the transfer nip NT of the transfer device **30** toward the fixing nip NF of the fixing device **40** by the intermediate transport portion **59** while being sucked by a negative pressure. The fixing device **40** applies heat and a pressurizing force (fixing energy) to the sheet material P passing through the fixing nip NF. Accordingly, the toner image transferred to the sheet material P is fixed to the sheet material P.

The sheet material P discharged from the fixing device **40** is subjected to the processing by the post-processing portion **60** while being transported toward a discharged medium receiving portion outside the apparatus by the medium discharging portion **54**. First, the sheet material P heated by the fixing device **40** is cooled by the medium cooling portion **62**. Next, the curve of the sheet material P is corrected by the correction device **64**. In addition, in the toner image fixed to the sheet material P, the presence or absence or a degree of toner concentration defects, image defects, image position defects, or the like is detected by the image inspection portion **66**. Moreover, the sheet material P is discharged to the outside of the second housing **14** by the medium discharging portion **54**.

Meanwhile, when an image is formed on a non-imaged surface (rear surface) of the sheet material P on which the image is not formed (when duplex printing is performed), the control portion **68** switches the transport path of the sheet material P passing through the image inspection portion **66** from the medium discharging portion **54** to the medium returning portion **58**. Accordingly, the front and rear of the sheet material P are inverted, and the sheet material is sent to the medium supply portion **52**. The image is formed (fixed) on the rear surface of the sheet material P by the process similar to the above-described process, and the sheet material is discharged to the outside of the second housing **14** by the medium discharging portion **54**.

Main Portion Configuration

Next, the sheet feeding device **70** or the like will be described. As shown in FIG. **8**, two sheet feeding devices **70** are provided to be arranged in the up-down direction of the apparatus, and two sheet feeding devices **70** have the similar configuration. Accordingly, here, one sheet feeding device **70** will be described.

The sheet feeding device **70** is drawn to the front side in the depth direction of the apparatus with respect to the first housing **12**. Moreover, in a state where the sheet feeding device **70** is drawn from the first housing **12**, a user may stack the sheet material P on the sheet feeding device **70**.

Moreover, a transport roller **72**, which comes into contact with the uppermost sheet material P among the sheet materials P stacked on the sheet feeding device **70** and transports (supplies) the uppermost sheet material P by the rotation of the transport roller, is provided above the sheet feeding device **70** which is mounted on the first housing **12**.

Sheet Feeding Device **70**

As shown in FIG. **6**, the sheet feeding device **70** includes a box member **74** in which the upper portion is opened, and a bottom plate **78** which is disposed in the inner portion of the box member **74** and is a stacking plate on which the sheet material P is stacked. In addition, the sheet feeding device **70** includes a lifting and lowering unit (not shown) which lifts and lowers the bottom plate **78**, the bottom plate **78** is lifted by the lifting and lowering unit in the state where the sheet feeding device **70** is mounted on the first housing **12**, and thus, the uppermost sheet material P stacked on the bottom plate **78** comes into contact with the transport roller **72**.

Meanwhile, in a state where the sheet feeding device **70** is drawn from the first housing **12**, the bottom plate **78** is lowered by the lifting and lowering unit, and the user may stack the sheet material P on the bottom plate **78**. In addition, FIG. **6** shows the state where the bottom plate **78** is lowered.

End Guide

Moreover, the sheet feeding device **70** includes an end guide **80** which abuts the rear end portion (right end portion in the drawing) of the sheet material P stacked on the bottom plate **78**, and thereby arranges the stacking position in a transport direction (an arrow B in the drawing: hereinafter, simply referred to as a "sheet material transport direction") of the sheet material P in the bottom plate **78**.

The end guide **80** is disposed at the center side in the width direction (C direction in the drawing: hereinafter, simply referred to as a "sheet martial width direction") of the sheet material P stacked on the bottom plate **78** in the inner portion of the box member **74**. Moreover, the end guide **80** includes a plate surface **80**A which is directed to the downstream side in the sheet material transport direction, and is mounted on a bottom plate **74**A of the box member **74** so as to be moved in the sheet material transport direction. In addition, a clearance hole **78**A extending in the sheet material transport direction is formed on the bottom plate **78** so that the end guide **80** is movable.

In this configuration, the plate surface **80**A of the end guide **80** abuts the rear end portion of the stacked sheet material P, and thus, the stacking position in the sheet material transport direction of the sheet material P stacked on the bottom plate **78** is not deviated.

Side Guide **84**

In addition, the sheet feeding device **70** includes a side guide **84** which is an example of a first arrangement member which abuts the end portion in the sheet material width direction of the sheet material P stacked on the bottom plate **78** and arranges the stacking position in the sheet material width direction of the sheet material P.

Two side guides **84** are disposed to oppose each other in the sheet material width direction, and are disposed at the downstream side in the sheet material transport direction in the inner portion of the box member **74**. Each of two side guides

84 has a symmetrical structure, and one side guide 84 includes a plate surface 86A which is directed to the other side guide.

Each of the side guides 84 is mounted on the bottom plate 74A of the box member 74 to be moved in the sheet material width direction. In addition, a clearance hole 78B is formed on the bottom plate 78 so that the side guides 84 are movable. Moreover, a movement unit (not shown), by which the other side guide 84 is also similarly moved if one side guide 84 is moved, is provided, and thus, the center position of the sheet material P is stacked at the center position of the bottom plate 78 (a so-called center register method). Moreover, when a small guide 100 described below is mounted on the side guide 84, a portion of the clearance hole 78B extends to the inner side (the side on which the sheet material P is stacked) in the sheet material width direction so that the bottom plate 78 and the small guide 100 do not interfere with each other (refer to FIG. 2).

As described above, since two side guides 84 have the similar configuration, in descriptions below, only one side guide 84 will be described.

As shown in FIGS. 1A and 1B, the side guide 84 is formed by bending a sheet metal member, and includes a rising portion 86 extending in the up-down direction, and an upward portion 88 which is connected to the lower end of the rising portion 86 and in which the plate surface faces upward. In addition, as described above, the side on which the sheet material P is stacked in the rising portion 86 becomes the plate surface 86A abutting the end portion in the width direction of the stacked sheet material P.

In addition, an insertion hole 88A used to mount the small guide 100 described below is formed on the upward portion 88. The insertion hole 88A is disposed in the downstream side in the sheet material transport direction on the upward portion 88.

In addition, a screw hole 86B used to mount the small guide 100 is formed on a flange, which is formed on the rising portion 86, toward the upper portion. The screw hole 86B is disposed at the upper portion in the rising portion 86 and the downstream side in the sheet material transport direction.

In addition, as an example of a first blown-out port from which air sprayed to the end portion in the width direction of the sheet material P including the stacked uppermost sheet material P is blown out, a blown-out port 90 is formed on the plate surface 86A of the rising portion 86. The blown-out port 90 is formed in a rectangular shape and is disposed below the screw hole 86B (refer to FIG. 5).

In addition, as shown in FIG. 4, a blower 92, which blows air from the blown-out port 90 in the sheet width direction, is mounted on a surface 86C opposite to the plate surface 86A in the rising portion 86.

Small Guide 100

In addition, the sheet feeding device 70 includes the small guide 100 which is an example of a second arrangement member which is mounted to be attached to and detached from the side guide 84 and is disposed on the side on which the sheet material P is disposed in the side guide 84. The small guide 100 mounted on the side guide 84 abuts the end portion in the sheet material width direction of a small sheet material P (for example, a postal card or the like) having a narrower width than the sheet material P (for example, A4 size) arranged by the side guide 84, and arranges the position in the sheet material width direction of the small sheet material P. When a small sheet material P, which has a small size such as a postal card which is not arranged (is not abutted) even when the side guide 100 is moved to the inner side within the movable range, is supplied, the small side guide 100 is used.

In descriptions below, the sheet material P arranged by the side guide 84 is referred to as a sheet material P1, and a small sheet material arranged by the small guide 100 is referred to as a small sheet material P2.

As shown in FIGS. 1A and 1B, the small guide 100 is formed by bending a sheet metal member, and includes a rising portion 102 extending in the up-down direction and an upward portion 104 which is connected to the upper end of the rising portion 102 and in which the plate surface faces upward.

In addition, the side on which the small sheet material P2 is stacked in the rising portion 102 becomes a plate surface 102A which abuts the end portion in the width direction of the stacked small sheet material P2. An insertion claw 102B which is inserted into the above-described insertion hole 88A is formed on the lower end of the rising portion 102.

Moreover, circular holes 104A are formed at the outside (the side opposite the side on which the small sheet material P2 is stacked) in the sheet material width direction in the upward portion 104. The insertion claw 102B is inserted into the insertion hole 88A, a screw 108 passes through the circular hole 104A, the screw 108 is fastened to the screw hole 86B, and thus, the small guide 100 is mounted on the side guide 84 (refer to FIG. 1B).

In addition, as an example of a second blown-out port from which air sprayed to the end portion in the width direction of the small sheet material P2 including the stacked uppermost small sheet material P2 is blown out, a blown-out port 110 is formed on the rising portion 102. The blown-out port 110 is formed in a rectangular shape and is disposed at the upper portion in the rising portion 102. A blown-out area of the blown-out port 110 is smaller than a blown-out area of the blown-out port 90 of the side guide 84. The blown-out area is an area from which the air is blown out, and when an outlet area of an air duct 116 described below is smaller than the area of the blown-out port 110, the blown-out area corresponds to the outlet area of the air duct 116 described below.

Air Duct 116

As shown in FIGS. 1A and 1B, the sheet feeding device 70 includes the air duct 116 which is an example of a passage member in which a passage 114 introducing the air blown out from the blown-out port 90 into the blown-out port 110 is formed.

The air duct 116 is mounted on the upward portion 104 of the small guide 100 in advance using two screws 120. In the state where the small guide 100 is mounted on the side guide 84, the air duct 116 includes a seal member 118 (refer to FIG. 3) which comes into contacting with the plate surface 86A.

As described above, since the blown-out area of the blown-out port 110 is smaller than the blown-out area of the blown-out port 90, as shown in FIG. 3, the passage 114 of the air duct 116 is narrowed from the blown-out port 90 toward the blown-out port 110. An outlet of the air duct 116 is directed to the blown-out port 110.

Operation of Main Portion Configuration

Next, the case in which the small sheet material P2 having a smaller size than the sheet material P1 arranged by the side guide 84 is stacked on the sheet feeding device 70 will be described.

When the small sheet material P2 is stacked on the bottom plate 78 of the sheet feeding device 70, the sheet feeding device 70 is drawn from the first housing 12, and as shown in FIGS. 1A and 1B, the small guide 100 is mounted on the side guide 84.

Moreover, the small sheet material P2 is stacked on the bottom plate 78, and as shown in FIG. 2, the plate surface 102A of the small guide 100 abuts the end portion in the width

direction of the stacked small sheet material P2, and the stacking position in the sheet material width direction of the small sheet material P2 is arranged.

In this state, when the sheet feeding device **70** is mounted on the first housing **12**, the bottom plate **78** is lifted by the lifting and lowering unit, and the uppermost small sheet material P2 stacked on the bottom plate **78** comes into contact with the transport roller **72**. Moreover, the end portion in the sheet material width direction of the upper side small sheet material P2 in the stacked sheet material P opposes the blown-out port **110**.

The blower **92** is operated, and thus, air is blown out from the blown-out port **90** of the side guide **84**. As shown in FIG. **3**, the air blown out from the blown-out port **90** is blown out from the blown-out port **110** through the passage **114** of the air duct **116**. The air blown out from the blown-out port **110** is sprayed to the end portion in the sheet material width direction of the small sheet material P2.

Here, since the air blown out from the blown-out port **90** is introduced to the blown-out port **110** by the air duct **116**, an amount of the air, which is blown out from the blown-out port **110**, per unit time is increased compared to when the air duct **116** is not used.

Accordingly, the air sprayed to the end portion in the sheet material width direction of the small sheet material P2 enters between the stacked small sheet materials P2, and separates the small sheet materials. In other words, sticking between the small sheet materials is suppressed.

Conclusion of Main Portion Configuration

As described above, when the small sheet material P2 is used, the sticking between the small sheet materials is suppressed by using the air duct **116**.

In addition, as described above, the blown-out area of the blown-out port **110** is smaller than the blown-out area of the blown-out port **90**. Accordingly, a flow velocity of the air blown out from the blown-out port **110** is higher than the flow velocity of the air blown out from the blown-out port **90**. Accordingly, the air sprayed to the end portion in the sheet material width direction of the small sheet material P2 effectively enters between the stacked small sheet materials P2. In this way, the sticking between the small sheet materials is suppressed.

In addition, since the sticking between the small sheet materials P2 is suppressed, the small sheet material P2 is suppressed from being overlapped and transported (double fed).

Moreover, since the double feeding of the small sheet material P2 is suppressed in the image forming apparatus **10**, an image is formed on each small sheet material P2 which is transported.

## Second Exemplary Embodiment

Next, examples of a sheet feeding device and an image forming apparatus according to a second exemplary embodiment of the present invention will be described with reference to FIGS. **9** to **11**. Moreover, the same reference numerals are assigned to the same members as the first exemplary embodiment, the descriptions thereof are omitted, and portions different from the first exemplary embodiment are mainly described.

As shown in FIG. **11**, a blower **150** used in a sheet feeding device **140** of the second exemplary embodiment includes two blowing passages **152** which feed air.

The two blowing passages **152** are disposed to be arranged in the sheet material transport direction, and are configured to include a first blowing passage **152**A and a second blowing passage **152**B which is disposed at the downstream side in the sheet material transport direction with respect to the first blowing passage **152**A.

In addition, a blown-out port **162**A (an example of a first blown-out port) from which the air fed from the first blowing passage **152**A is blown out, and a blown-out port **162**B from which the air fed from the second blowing passage **152**B is blown out are formed on the side guide **84**. The blown-out area of the blown-out port **110** is smaller than the blown-out area of the blown-out port **162**A.

Moreover, as shown in FIGS. **9** and **10**, in a state where the small guide **100** is mounted on the side guide **84**, a passage **164** which introduces the air blown out from the blown-out port **162**A to the blown-out port **110** is formed on an air duct **166** (an example of the passage member). In addition, a closing portion **166**A which closes the blown-out port **162**B is formed on the air duct **166**.

Effects of the second exemplary embodiment are similar to those of the first exemplary embodiment.

In addition, specific exemplary embodiments of the present invention are described in detail. However, the present invention is not limited to the exemplary embodiments, and it is obvious that various exemplary embodiments of the present invention are possible within the scope of the present invention by those skilled in the art. For example, in the exemplary embodiment, the blown-out area of the blown-out port **110** is smaller than the blown-out area of the blown-out port **90**. However, the blown-out areas may be the same as each other, and the blown-out area of the blown-out port **110** may be larger than the blown-out area of the blown-out port **90**. In a case that the blown-out areas are the same as each other, the flow velocity of the air blown out from the blown-out port **110** is the same as the flow velocity of the air blown out from the blown-out port **90**, and the sticking between the small sheet materials is effectively suppressed.

The foregoing description of the exemplary embodiments of the present invention has been provided for the purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Obviously, many modifications and variations will be apparent to practitioners skilled in the art. The embodiments were chosen and described in order to best explain the principles of the invention and its practical applications, thereby enabling others skilled in the art to understand the invention for various embodiments and with the various modifications as are suited to the particular use contemplated. It is intended that the scope of the invention be defined by the following claims and their equivalents.

What is claimed is:

**1**. A sheet feeding device comprising:

a first arrangement member that abuts an end portion in a width direction of a fed and stacked sheet material, arranges the width direction of the sheet material, and forms a first blown-out port from which air sprayed to the end portion in the width direction of the sheet material is blown out;

a second arrangement member that is mounted on the first arrangement member, is disposed in a sheet material side with respect to the first arrangement member, abuts an end portion in a width direction of a small sheet material having a narrower width than the sheet material arranged by the first arrangement member, arranges the width direction of the small sheet material, and forms a second blown-out port from which air sprayed to the end portion in the width direction of the stacked small sheet material is blown out; and

a passage member that forms a passage introducing the air blown out from the first blown-out port to the second blown-out port,

wherein the second arrangement member is arranged to be detachable and attachable to the first arrangement member,

wherein the passage member is disposed on the second arrangement member, and

wherein the passage member is formed in a tubular shape.

**2**. The sheet feeding device according to claim **1**,

wherein a blown-out area of the second blown-out port is smaller than or equal to a blown-out area of the first blown-out port.

**3**. An image forming apparatus comprising:

the sheet feeding device according to claim **1**; and

an image forming portion that forms an image on a sheet material fed by the sheet feeding device.

**4**. An image forming apparatus comprising:

the sheet feeding device according to claim **2**; and

an image forming portion that forms an image on a sheet material fed by the sheet feeding device.

**5**. A sheet feeding device according to claim **1**, wherein the passage member covers the first blown-out port.

**6**. A sheet feeding device comprising:

a first arrangement member that abuts an end portion in a width direction of a fed and stacked sheet material, arranges the width direction of the sheet material, and forms a first blown-out port from which air sprayed to the end portion in the width direction of the sheet material is blown out;

a second arrangement member that is detachably and attachably mountable on the first arrangement member, is disposed at a sheet material side with respect to the first arrangement member, abuts an end portion in a width direction of a small sheet material having a narrower width than the sheet material arranged by the first arrangement member, arranges the width direction of the small sheet material, and forms a second blown-out port from which air sprayed to the end portion in the width direction of the stacked small sheet material is blown out; and

a passage member that is disposed on the second arrangement member, is formed in a tubular shape, and forms a passage introducing the air blown out from the first blown-out port to the second blown-out port.

* * * * *